Claims 1-8 are pending.

Claims 9-18 were previously withdrawn.

Claim 1 is currently amended.

1.   (Currently amended) A middleware communication space enabling coordination of one or more distributed applications <u>stored on computer readable storage media</u> in a partially connected ad hoc wireless network, the middleware comprising:

a proxy component <u>stored on computer readable storage media and</u> configured to receive data from the one or more distributed applications;

a protocol agent <u>stored on computer readable storage media and</u> coupled to the proxy component, the protocol agent configured to monitor metadata for transport and to govern <u>asynchronous</u> transport of messages in the partially connected ad hoc network <u>wherein the protocol agent connects to one</u> network at a time; ~~and~~

a metadata storage component <u>stored on computer readable storage media and</u> coupled to the proxy component and the protocol agent, the metadata storage component configured to store metadata capable of being transported as a message according to the one or more distributed applications, the middleware communication space providing a<u>n</u> <u>asynchronous</u> bridge between two or more partially-connected networks, the bridge enabling temporary storage of the messages to enable transparent messaging between two or more devices[[.]]<u>;</u>

a discovery component stored on computer readable storage media and coupled to the protocol agent to determine one or more neighbor devices according to a listen and announce protocol;

a choosing component stored on computer readable storage media and coupled to the discovery component to choose a neighbor device for receipt of one or more messages, the choosing comprising:

  deriving a stochastic model of the dynamically changing topology;

  using the stochastic model, evaluating routes for delivering the messages according to the expected path length;

  determining a shortest expected path route from the evaluated routes; and

delivering messages to another device to propagate messages between the networks.

2.   (Original) The middleware communication space of claim 1 wherein the message is in one or more of a SOAP format and a WS series protocol format.

3.   (Original) The middleware communication space of claim 1 wherein the middleware storage component holds a plurality of the messages in eXtended Markup Language (XML), the messages in a hierarchical structure.

4.   (Original) The middleware communication space of claim 1 wherein the metadata includes: web service routing protocol (WS-Routing) data that defines routing data; and data appropriate for an extended protocol to provide processing information for the protocol agent.

5.   (Original) The middleware communication space of claim 1 wherein the middleware communication space provides one or more of message caching, transferring and routing.

6.   (Previously presented) The middleware communication space of claim 1 wherein the messages are organized into a plurality of data fields including at least one or more of:

an expiration time data field identifying the expiration of the message in absolute time such that data are invalid after the identified time;

a hop limitation data field providing an upper bound of hops that a message can be transferred, the upper bound decreasing by one after a successful transmission;

a timestamp data field providing a absolute time marking creation time of the message;

a namespace data field identifying a subspace in which the message is placed;

an administration domain data field identifying a domain to which the message is restricted, the administration domain data field defining a physical bound of devices which share a same administration privilege;

a relatedness data field specifying a topic to which the message is related, the relatedness providing a relationship attribute to define an action when two or more messages are related to the topic;

a priority data field defining a priority of the message; and

a property data field providing an extensible component for the distributed application to define application-specific properties with the message.

7.   (Original) The middleware communication space of claim 6 wherein the messages are organized into at least three of the data fields.

8.   (Original) The middleware communication space of claim 6 wherein the messages are organized into at least six of the data fields.

9.   (Withdrawn) A method of communicating between a distributed application and a middleware component, the method comprising:

issuing a call having a length, the call identifying a message identifier and metadata, the call to remove the metadata from the middleware component; and

asynchronously receiving the metadata from the middleware component, the receiving via a virtual shared communication buffer located on one or more mobile devices, the receiving independent of the existence of a network connection between the mobile device and the distributed application.

10.   (Withdrawn) A hierarchical application programming interface (API) embodied on one or more computer readable media, the application programming interface comprising:

a first set of APIs related to operations of a middleware communication space;

a second set of APIs related to event registration; and

a third set of APIs related to namespace operations, the hierarchical API enabling separation of basic operations of a middleware communication space from security

related operations in an environment that allows messaging between disconnected networks using a mobile device, the mobile device independent of simultaneous connection to the disconnected networks.

11.   (Withdrawn) The hierarchical API of claim 10 wherein the first set of APIs includes:

a write function that provides for distributed applications to call a write to insert metadata into the middleware communication space;

a read function configured to read out metadata and removing data from the middleware communication space and remove data and leave the metadata unchanged; and

an enumerate and search function configured to enumerate metadata according to a template of selective criteria.

12.   (Withdrawn) The hierarchical API of claim 10 wherein the second set of APIs includes APIs directed to registration and deregistration via a register function configured to register a handler of one or more events according to a template configured to filter according to type of event.

13.   (Withdrawn) The hierarchical API of claim 10 wherein the third set of APIs in namespace operation APIs including:

a space export and import function to configure which (sub-)space should be shared with one or more devices; and

an enumerate sub-space function configured to provide that a sub-space in the middleware communication space can be enumerated according to a template that specifies the selective criteria that sub-spaces associated with the distributed application are to enumerate.

14.   (Withdrawn) A computer readable medium comprising:
executable code adapted to perform a function responsive to a call from a component, the function comprising:

> one or more operation parameters representing possible operations performable by the component configured to affect a middleware communication space;
> one or more event parameters representing event registration for events related to the middleware communication space; and
> one or more namespace parameters representing security related operations within the middleware communication space; and

executable code adapted to receive the operation parameters, event parameters and namespace parameters and provide a middleware communication space enabling a mobile device to act as a bridge between one or more disconnected networks transparent to a distributed application.

15.   (Withdrawn) A method for a mobile device to perform as a bridge between two or more networks in a dynamically changing topology, the method comprising:

performing discovery to determine one or more neighbor devices according to a listen and announce protocol;

maintaining storage for metadata including storage for an expected path length;

choosing a neighbor device for receipt of one or more messages, the choosing comprising:

      deriving a stochastic model of the dynamically changing topology;

      using the stochastic model, evaluating routes for delivering the messages according to the expected path length;

      determining a shortest expected path route from the evaluated routes using; and

delivering messages to another device to propagate messages between the networks.

16.   (Withdrawn) The method of claim 15 wherein the mobile device is a node in the topology, the determining a stochastic model including assigning a probabilistic weight representing a probability of a connection between two nodes in the topology.

17.   (Withdrawn) A computer readable medium having computer executable code thereon to perform acts that enable a mobile device to perform as a bridge between two or more networks in a dynamically changing topology, the acts comprising:

performing discovery to determine one or more neighbor devices according to a listen and announce protocol;

maintaining storage for metadata including storage for an expected path length;

choosing a neighbor device for receipt of one or more messages, the choosing comprising:

deriving a stochastic model of the dynamically changing topology;

using the stochastic model, evaluating routes for delivering the messages according to the expected path length;

determining a shortest expected path route from the evaluated routes using; and

delivering messages to another device to propagate messages between the networks.

18.   (Withdrawn) The computer readable medium of claim 17 wherein the mobile device is a node in the topology, the determining a stochastic model including assigning a probabilistic weight representing a probability of a connection between two nodes in the topology.